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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/058,430	01/30/2002	Keiji Kanao	2635-91	4297

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EXAMINER

DONG, DALEI

ART UNIT	PAPER NUMBER
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2875

DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/058,430

Applicant(s)

KANA O ET AL.

Examiner

Dalei Dong

Art Unit

2875

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) 9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 January 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☒ Certified copies of the priority documents have been received in Application No. 10/058,430.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other:

## DETAILED ACTION

### *Drawings*

1. New corrected drawings are required in this application because the drawing contains informal numbering of components and label of figures. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

### *Claim Objections*

2. Claims 1-8 are objected to because of the following informalities: For claim 1, line 18, the unit for the length should not be "mm<sup>2</sup>" and should be mm. Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,347,193 to Oshima.

Regarding to claims 1, 3 and 7, Oshima discloses in Figures 1 and 2, a spark plug, “the spark plug has a cylindrical metallic shell 2, to a front end of which a L-shaped outer electrode 1 is fixedly attached by means of welding. Within the metallic shell 2, is a tubular insulator 3 is placed, an inner space of which serves as an axial bore 31. The insulator 3 has a shoulder 32 which is, by way of a packing 22, received by a stepped portion 21 provided with an inner wall of the metallic shell 2 so as to support the insulator 3 within the metallic shell 2. A rear head 23 of the metallic shell 2 is inturned to engage against an outer surface of the insulator 3 by means of caulking to secured the insulator 3 against removal” (column 3, line 35-47).

Oshima also discloses in Figures 1 and 2, “within the axial bore 31 of the insulator 3, is a center electrode 4 placed whose front end 4A somewhat diametrically reduced, and extends beyond that of the insulator 3. A rear end 4B of the center electrode 4 is brought into engagement with a stepped shoulder 4C which is provided with an inner wall of the axial bore 31. To a rear end of the center electrode 4, is a middle axis 35 connected by way of a monolithic resistor 34 is interposed between glass sealants 33a, 33b” (column 3, line 48-56).

Oshima further discloses in Figures 1 and 2, “meanwhile, the outer electrode 1 is made of nickel or nickel-based alloy to which a tip 6 is welded in correspondece with a tip 5 as described hereinafter so as to form a spark gap (Sp) with the tip 5. The tip 6 is made of platinum (Pt), iridium (It) or alloy of platinum (Pt) and nickel (Ni), in which a ratio of nickel (Ni) ranges from 10.0 wt % to 40.0 wt %” (column 3, line 57-63).

Oshima further yet discloses in Figure 4, "a dimensional relationship of A, B, C, D, E and F is as follows:

$0.3 \text{ mm} \leq A \leq 0.8 \text{ mm}$ ,  $1.2A \leq B \leq 3A$ ,  $0.1 \text{ mm} \leq (C-A)/2 \leq 0.5 \text{ mm}$ ,  $D \leq (C-A)/2$ ,  $E \geq B/4$ ,  $0 \text{ mm} \leq F \leq 0.5 \text{ mm}$  and  $A/5 \leq G \leq A/2$ .

Where

A: a diameter of the columnar tip 5,

B: a length of the columnar tip 5,

C: a diameter of the front end 4A of the nickel-alloyed metal 41,

D: a length of the front end 4A of the nickel-alloyed metal 41,

E: a length of the front portion 53 of the tip 5 which is protracted from the recess 43,

F: a distance between the rear end 52 of the tip 5 and the front end 42a of the heat-conductor core 42,

G: a distance of a welding portion 5A penetrated from the outer surface 51a of the tip 5 to the inner surface 43a of the recess 43 when the tip 5 is bonded to the inner surface 43a of the recess 43 by means of laser or electron beam welding" (column 4, line 24-44).

Oshima further yet discloses "the incidence energy of the laser welding to the front end surface 41a of the nickel-alloyed metal 41, which decreases the formation of the welding portion 5a (Ir - Ni alloyed layer) 5A so as to lose the firmness between the outer surface 51a of the tip 5 and the inner surface 43a of the recess 43" (column 5, line 2-7).

*Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,347,193 to Oshima.

Regarding to claim 2, Oshima discloses the claimed invention except for the radius of the fused junction of  $D/4 \leq R \leq 3D/4$ . Oshima discloses in Figures 2 to 7 and 11a to 12b, that it is well known in the art to provide a fused junction with different radius for different embodiments according to the design and the specification of the device. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have a round fused junction, as taught by Oshima in order to provide the capability of effectively preventing the temperature of a tip from abnormally rising so as to keep the tip firmly in place without falling the tip off the recess by thermal damage of the welding portion, and contributing to an extended service life with relatively low cost.

Furthermore, Oshima discloses the claimed invention except for radius of the fused junction of  $D/4 \leq R \leq 3D/4$ . It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a radius of the fused junction of  $D/4 \leq R \leq 3D/4$ , since it has been held that discovering an optimum value of a result

effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

7. Claim 4 rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,347,193 to Oshima in view of U.S. Patent No. 6,304,022 to Matsutani.

Regarding to claim 4, Oshima discloses A spark plug comprising: a tubular housing; a central electrode supported by said tubular housing in said tubular housing with electrical insulation therebetween; an earth electrode extending from one end of said tubular housing; a chip, arranged at an end surface of said earth electrode to face said central electrode, for providing a spark gap between said central electrode and said chip, said chip including a novel metal; and a fused junction layer between said earth electrode and said chip including components of said chip and said earth electrode to fix said chip to said earth electrode, wherein a cross-sectional area of said chip at a tip thereof on the opposite side of said fused junction layer is not less than 0.12 mm.<sup>sup.2</sup> and not more than 1.15 mm.<sup>sup.2</sup>, and a length from said end surface to a top surface of said tip is not less than 0.3 mm.<sup>sup.2</sup> and not more than 1.5 mm.<sup>sup.2</sup>, and wherein said fused junction layer has substantially a conical outer surface continuously connecting a peripheral outer surface of said chip to said end surface of said earth electrode with a radius on a sectional plane along an axis of said chip.

However, Oshima does not discloses chip mainly includes Ir and further includes at least one of Rh of lower than or equal to 50% by weight, Pt of lower than or equal to 50% by weight, Ni of lower than or equal to 40% by weight, W of lower than or equal to

30% by weight, Pd of lower than or equal to 40% by weight, Ru of lower than or equal to 30% by weight, and Os of lower than or equal to 20% by weight.

Matsutani teaches "As the additional component, there may be used at least one element selected from among Rh, Pt, Ir, Pd, Re, Ru, Nb, Os, and W, so long as the element is different from the main component element. For example, when a spark discharge portion is formed from an alloy which contains Ir as a main component and to which at least one element selected from among Rh, Pt, Pd, Re, Ru, Nb, Os, and W is added, the main component element is Ir, and the additional component element is at least one element selected from among Rh, Pt, Pd, Re, Ru, Nb, Os, and W. More specifically, when the alloy forming the spark discharge is an Ir--Rh binary alloy which contains Ir as a main component and Rh as an additional component, the main component element is Ir and the additional component element is Rh. Likewise, when the alloy forming the spark discharge is an Ir--Rh--Pt ternary alloy which contains Ir as a main component and Rh and Pt as additional components, the main component element is Ir and the additional component elements are Rh and Pt" (column 4, line 62-67 to column 5, line 1-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilize the chip electrode of Matsutani for the spark plug of Oshima in order to improve durability of the spark discharge portion improved through control of alloy structure of the spark discharge portion from a point of view other than crystal grain morphology.



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8. Claims 5, 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,347,193 to Oshima in view of U.S. Patent No. 4,786,267 to Toya.

Regarding to claims 5, 6 and 8, Oshima discloses A spark plug comprising: a tubular housing; a central electrode supported by said tubular housing in said tubular housing with electrical insulation therebetween; an earth electrode extending from one end of said tubular housing; a chip, arranged at an end surface of said earth electrode to face said central electrode, for providing a spark gap between said central electrode and said chip, said chip including a novel metal; and a fused junction layer between said earth electrode and said chip including components of said chip and said earth electrode to fix said chip to said earth electrode, wherein a cross-sectional area of said chip at a tip thereof on the opposite side of said fused junction layer is not less than 0.12 mm.<sup>sup.2</sup> and not more than 1.15 mm.<sup>sup.2</sup>, and a length from said end surface to a top surface of said tip is not less than 0.3 mm.<sup>sup.2</sup> and not more than 1.5 mm.<sup>sup.2</sup>, and wherein said fused junction layer has substantially a conical outer surface continuously connecting a peripheral outer surface of said chip to said end surface of said earth electrode with a radius on a sectional plane along an axis of said chip.

Oshima further discloses "the incidence energy of the laser welding to the front end surface 41a of the nickel-alloyed metal 41, which decreases the formation of the welding portion 5a (Ir - Ni alloyed layer) 5A so as to lose the firmness between the outer surface 51a of the tip 5 and the inner surface 43a of the recess 43" (column 5, line 2-7).

However, Oshima does not disclose a chip mainly includes Pt and further includes at least one of Ir of lower than or equal to 50% by weight, Ni of lower than or equal to 40% by weight, Rh of lower than or equal to 50% by weight, W of lower than or equal to 30% by weight, Pd of lower than or equal to 40% by weight, Ru of lower than or equal to 30% by weight, and Os of lower than or equal to 20% by weight.

Toya teaches "thin noble metal layers 10,11 are formed on or in the end surface of the center electrode (1) and a discharge-related area of the inner end surface of the ground electrode 7 by bonding noble metal powder 9 [see, FIG. 3(c) for example] to the end surface and discharge-related area in accordance with ultrasonic bonding. As exemplary material useful as the noble metal powder 9 in the formation of the thin noble metal layers 10,11, may be mentioned pure noble metals such as Pt, Pd, Ir, Ru, Rh and Au; alloys of these noble metals (may hereinafter be called "noble metal alloys" for the sake of clarification) such as Pt-Pd, Pt-Ir, Pt-Ru, Pt-Rh, Pt-Ir-Pd, Pt-Ir-Ru, Pt-Ir-Pd-Ru and Au-Pd alloys; alloyed noble metal materials obtained by adding Ni, WSi or W to the above noble metals or noble metal alloys, including Pt alloys such as Pt-Ni, Pt-W, Pt-WSi and Pt-Ir-Ni, Pd alloys such as Pd-Ni, Pd-W, Pd-WSi and Pd-Pt-Ni, Ir alloys such as Ir-Ni, Ir-W, Ir-WSi and Ir-Pd-Ni, Ru alloys such as Ru-Ni, Ru-W, Ru-WSi and Ru-Pt-Ni, Rh alloys such as Rh-Ni, Rh-WSi and Rh-Pt-Ni and Au alloys such as Au-Ni, Au-W and Au-WSi; and mixtures consisting each of at least two of the above noble metals, noble metal alloys and alloyed noble metal materials. Besides, all other Pt -base alloys may also be used in the practice of this invention" (column 4, line 30-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilize the electrode of Toya for the spark plug of Oshima in order to free from wasting of noble metals so as to permit a significant reduction to the manufacturing cost and is provided with a noble metal layer of good properties at a discharge-related surface area of at least one of center and ground electrodes so as to improve its durability.

### *Conclusion*

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following prior art are cited to further show the state of the art of composition of a spark plug.

U.S. Patent No. 4,700,103 to Yamaguchi.

U.S. Patent No. 5,124,612 to Takamura.

U.S. Patent No. 5,977,695 to Osamura.

U.S. Patent No. 6,078,129 to Gotou.

U.S. Patent No. 6,093,071 to Osamura.

U.S. Patent No. 6,147,441 to Osamura.

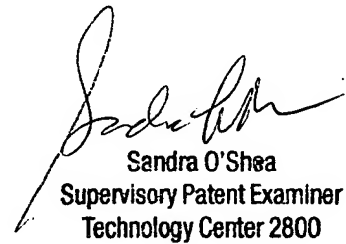
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dalei Dong whose telephone number is (703)308-2870. The examiner can normally be reached on 8 A.M. to 5 P.M..

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (703)305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9318 for regular communications and (703)872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

D.D.  
March 18, 2003



Sandra O'Shea  
Supervisory Patent Examiner  
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